City of Santa Barbara
Parks and Recreation Department

Memorandum

DATE: June 16, 2010

TO: Creeks Restoration/Water Quality Improvement Program
Citizen Advisory Committee

FROM: Jill Murray, Water Resources Specialist

SUBJECT: **WATER QUALITY RESEARCH AND MONITORING PROGRAM UPDATE AND FISCAL YEAR 2011 RESEARCH PLAN**

COMMITTEE DIRECTION – FOR ACTION

That the Committee receive an update on the Water Quality Research and Monitoring Program and concur with the staff recommendation to implement the proposed Research Plan for Fiscal Year 2011.

DISCUSSION

Background

In June 2009, the Committee concurred with the staff recommendation to implement the Research Plan for Fiscal Year 2010 (FY10). In November 2009, the Committee received a presentation and discussed the results from the Fiscal Year 2009 Annual Water Quality Report. In this report, the Committee will receive a mid-year update on FY10 sampling, with a focus on sediment quality, storm monitoring, street slurry sealing, and beach water quality, along with recommended changes for the 2011 Fiscal Year Research Plan. The proposed FY11 Research Plan is attached.

The goals of the research and monitoring program are to:

1. Quantify the levels (concentration and flux, or load) of microbial contamination and chemical pollution in watersheds throughout the city.
2. Evaluate impacts of pollution on beneficial uses of creeks and beaches, including recreation and habitat for aquatic organisms.
3. Evaluate the effectiveness of the City's restoration and water quality treatment projects, which includes collecting baseline data for future projects.
4. Identify sources of contaminants and pollution in creeks and storm drains.
5. Evaluate long-term trends in water quality.

The underlying motivation behind the monitoring program is to obtain information that the City can use to:

1. Develop strategies for water quality improvement, including prioritization of capital projects and outreach/education programs.
2. Communicate effectively with the public about water quality.

The monitoring program consists of eight key elements:

1. Watershed Assessment
2. Storm Monitoring
3. Restoration and Water Quality Project Assessment
4. Beach Water Quality
5. Source Tracking/Illicit Discharge Detection
6. Creeks Walks/Clean ups
7. Bioassessment
8. Methods Development

Selected updates from several elements are presented below. Details can be found in the quarterly Water Quality Report at www.sbcreeks.com. Additional results will be presented in the Annual Water Quality Report, to be presented in January 2011.

Watershed Assessment - Sediment Quality

Sediment contamination is a concern because many pollutants adhere to sediments, accumulating and persisting for a much longer time than they do in the water column. However, assessing the impact of pollutants in sediments is challenging because the sediment can render the pollutants unavailable to organisms. In August 2009 the Creeks Division completed a third round of annual sediment testing and analyzed the results using the guidelines in California's new Sediment Quality Objectives (SQOs) for Enclosed Bays, Estuaries and Coastal Lagoons (adopted in 2009).

Based on recommendations from the Creeks Advisory Committee, the Creeks Division FY08 Research Plan called for sediment testing to assess the condition of sediment downstream the integrator stations, i.e. in the estuarine portion of Mission Creek, Arroyo Burro, and Sycamore, and the lower section in Laguna Channel. The Andre Clark Bird Refuge was sampled in 2008. Based on the results from the Bird Refuge, limited testing was also conducted there 2009. Chemistry tests included metals, pesticides, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs). In 2007 and 2008 acute toxicity was tested using a ten-day survival test with *Euhaustoriaus*. In 2009 a sublethal, or chronic, test was conducted using *Mytilus galloprovincialis*.

Using SQO methodology and a second method for freshwater sites (from the Southern California Coastal Waters Research Program), the overall score for each site was

determined. The conservative decision was made to use the maximum constituent concentrations observed over three years of sampling (two years for some compounds and sites) in the calculations.

Constituents of concern – Compounds which exceeded the most conservative sediment quality criteria for predicting toxicity included: low molecular weight PAHs, chlorinated pesticides (chlordane, DDDs, DDEs, DDTs), cadmium, and bifenthrin (a pyrethroid pesticide). These compounds have been tested in storm water runoff but with the exception of cadmium, have not been detected, likely because they are sequestered in sediments. Because most of the compounds detected are very insoluble in water, they can partition onto sediments and can remain there for long periods of time. The chlorinated pesticides that were detected are all legacy compounds, meaning they have been banned for some time and are no longer discharged to the environment. DDT was banned from use in the United States in 1972 and chlordane was banned in 1988. DDE and DDD are breakdown products of DDT. Pyrethroids have grown in use in recent years, primarily to control termites, and are highly toxic to aquatic invertebrates. Bifenthrin was detected in all sites except Sycamore, but criteria exist only for the freshwater sites. Polycyclic aromatic hydrocarbons (PAHs) and cadmium are likely from transportation sources, including fossil-fuel exhaust, runoff from road and parking lot seal coats, and wear of break linings.

Site Assessment - According to the SQO analysis conducted on estuarine sites, Arroyo Burro Estuary, Mission Lagoon, and Sycamore Lagoon have “minimal potential for a chemically mediated effect on the benthic [sediment] community.” For freshwater sites, the Bird Refuge and Laguna Channel are “unlikely to cause toxicity.” Laguna Channel, which is almost entirely developed, has the highest concentrations of most constituents. Toxicity tests from each site had “nontoxic” results. A bioassessment study would be required to finalize the determination that sites are not impacted at a biological level.

Storm Monitoring

Creeks staff collected samples during four storms in FY10. In addition, a simulated rainfall event was conducted in October 2009 to test street slurry seal runoff. During the first storm of the season, on October 13, 2009, samples were collected for first flush testing, Parking Lot Infiltration Project baseline data, Jesusita Fire effects, and slurry seal runoff. A second storm was sampled on December 7, 2009 for slurry seal testing and additional Parking Lot Infiltration baseline monitoring. On April 11, 2010, Mission Creek was sampled throughout a storm to gather information on timing, loads, and routes of pollutants in creeks. Finally, a storm on April 20, 2010 was sampled for storm drain toxicity (results are not yet available).

First flush sampling (the first storm of the season, when pollutant levels are generally highest) showed non-detectable or low levels of most pollutants, with the exception of surfactants and several pyrethroid pesticides. Of the pyrethroid pesticides tested, high levels of esfenvalerate and L-cyhalothrin were found in Mission Creek at Montecito St and high levels of cyfluthrin were found in Sycamore Creek at the railroad bridge.

Pyrethroids are gaining in popularity as other pesticides have been banned in California, but are highly toxic to aquatic organisms should they reach creeks. The Creeks Division has begun to educate residents about these findings and ways to reduce pyrethroid use and impact.

Limited testing done on early runoff from the Jesusita Fire burn site (Mission Canyon) did not result in high levels of chemical constituents, pH, or toxicity. However, extended sampling was not conducted due to safety concerns. Late-season storm sampling showed that surfactants and indicator bacteria entered Mission Creek at high levels early in the storm, as urban areas were drained. Later in the storm, turbidity and sediment concentrations were extremely high, reflecting sediment runoff from the upper watershed.

Beach Water Quality

In March 2010, the Creeks Division hired a water quality intern to conduct a statistical analysis of beach water quality data, in an effort to identify when and why beach warnings occur most frequently. While the Creeks Division recognizes the limitations of indicator bacteria in protecting human health, regulatory agencies will likely continue using indicator bacteria tests for years to come. Data analyzed in this study included indicator bacteria concentrations (total coliform, enterococcus, and fecal coliform), rainfall, lagoon status (open vs. closed), ocean water temperature, and tides (height, direction, and lunar phase). Most of the bacteria and lagoon data were provided by the County of Santa Barbara, as the County has conducted weekly testing of four beaches in the City (Arroyo Burro Beach, Leadbetter Beach, East Beach at Mission Creek, and East Beach at Sycamore Creek) for most of the past fifteen years. While data are still being analyzed, the following results have been obtained thus far:

- Beach warnings are three to six times (depending on beach and indicator bacteria group) more likely when rain has fallen in the previous 72 hours. Median indicator bacteria levels are also four to 13 times higher during wet weather compared to dry periods.
- During dry weather testing throughout the year, (i.e. those without rainfall in the previous 72 hours) indicator bacteria exceedance rates are low when coastal lagoons are closed to the ocean at Arroyo Burro, East Beach at Mission Creek, and East Beach at Sycamore Creek. Warnings for total coliform drop from 10% when lagoons are open, to almost zero when lagoons are closed. Warnings based on Enterococcus fall from 9% to 1%, and those for fecal coliform fall from 16% to 5%, when lagoons are closed. Even though creeks often continue to discharge high concentrations of indicator bacteria, the sand berms in front of closed lagoons likely function as large sand filters and lower indicator bacteria levels in the surf zone.
- Tide effects vary among beaches. At Leadbetter beach, falling (ebb) tides lead to 18% exeedances rates for Enterococcus, compared to 6-8% during slack and flood tides. This may reflect indicator bacteria in beach wrack (e.g., decaying kelp) being washed into the ocean, or may be due to sand releasing indicator bacteria as the tide lowers. At Arroyo Burro, moon phase proves important, with Spring tides

(more extreme high and low tides) leading to higher frequencies of beach warnings.

Street Slurry Sealing

The FY10 Research Plan included a research question and sampling effort geared to understanding the impacts of runoff from streets that have been coated recently with slurry seal. Published literature on parking lot sealcoats has shown that runoff and dust generated can be high in PAHs. In addition, Creeks Division staff have reported anecdotally that runoff from street slurry seal may produce high levels of foam, possibly contributing to foam observed in Arroyo Burro and Mission Creeks during storm events. In FY10 the Creeks Division conducted a simulated rainfall event on two sites: one with recent (< 1 month since application) slurry seal and a control site with asphalt that had not been sealed in over seven years. In addition, runoff was collected during two storm events from areas that had been sealed within the previous five weeks. In the rainfall simulation, results showed that more foam, and longer-lasting foam, was generated in runoff from the fresh slurry seal. In addition, toxicity was higher in runoff from the sealed site. Storm testing was less definitive, but warrants additional sampling in the coming year. A water quality intern, supervised by Dr. Arturo Keller (UCSB) will continue the Creeks Division research on this topic, and grant funding will be sought to conduct large-scale tests.

Source Tracking/Illicit Discharge Detection

The Creeks Division is working with Dr. Patricia Holden (UCSB) to complete the Source Tracking Protocol Development Project, which is funded by the State Water Board's Proposition 50 Clean Beaches Initiative Grant Program. Ongoing work includes use of dye and smoke testing techniques in storm drains, along with molecular techniques for identifying areas contaminated with human waste. In addition, canine scent tracking is also being tested as a potential tool, with field work conducted in June 2010.

Recommendations for FY11

After making substantial changes to the Research Plan for FY10, the Creeks Division recommends that the plan's elements and research questions remain unchanged for FY11. Minor adjustments are recommended for sediment testing and storm monitoring. For sediment assessment, Creeks Division staff recommends testing specifically for pyrethroid pesticides, PAHs, and toxicity, while expanding the sites to several within each watershed in the City. In addition, staff recommends conducing additional testing for pyrethroids and other emerging pesticides in storm runoff. A modified sampling table will be completed after additional sampling results from FY10 have been reviewed. The updated table will be discussed with the Committee when the Annual Water Quality Report is presented.

Next Steps

Staff will begin implementing the FY11 Research Plan and perform scheduled weekly, quarterly, project, and storm monitoring. Reporting will also continue on a quarterly and annual basis. The Committee will receive an update on the Source Tracking Protocol Development Study and a summary of the Fiscal Year 2010Annual Water Quality Report in January 2011.

cc: Cameron Benson, Creeks Restoration/Clean Water Manager
Jill E. Zachary, Assistant Parks and Recreation Director

City of Santa Barbara Creeks Division
Water Quality Monitoring
FY11 RESEARCH PLAN

The goals of the monitoring program are to:

1. Quantify the levels (concentration and flux, or load) of microbial contamination and chemical pollution in watersheds throughout the city.
2. Evaluate impacts of pollution on beneficial uses of creeks and beaches, including recreation and habitat for aquatic organisms.
3. Evaluate the effectiveness of the City's restoration and water quality treatment projects, which includes collecting baseline data for future projects.
4. Identify sources of contaminants and pollution in creeks and storm drains.
5. Evaluate long-term trends in water quality.

The underlying motivation behind the monitoring program is to obtain information that the City can use to:

1. Develop strategies for water quality improvement, including prioritization of capital projects and outreach/education programs.
2. Communicate effectively with the public about water quality.

PROGRAM ELEMENTS AND QUESTIONS

A. Watershed Assessment

Research questions:

1. Is overall water quality, in terms of indicator bacteria and field properties, getting better over time?
2. How contaminated and/or toxic is sediment at creek outfall sites?
3. What is the impact of eutrophication on Santa Barbara creeks?

B. Storm Monitoring

Research Questions:

1. What are the highest concentrations of pollutants of concern during storm events, particularly seasonal first flush storms? Do creeks and/or storm drains in Santa Barbara have problems with toxicity during storm events?
2. What are the loads of pollutants discharged from Santa Barbara creeks during storms?
3. What are the sources and routes of pollutants during storms?
    a. How do concentrations and loads vary during storms and from site to site?
        - Fecal indicator bacteria
        - Slurry seal/PAHs/Foam
        - Metals
        - Nutrients
4. How do restoration/treatment projects impact water quality during storm events?

C. Restoration and Water Quality Project Assessment

The Creeks Division has completed several restoration and water quality improvement capital projects over the past several years. Project assessment is used to determine the success of projects in lowering microbial and chemical pollution levels and improving water quality for aquatic organisms. In some cases project monitoring is grant-required, and the remaining is for internal review of project success. Additional monitoring is conducted to ensure that the facility is performing as intended.

Research Questions:

1. Do Creeks Division projects result in improved water quality, as reflected in pre- and post-project, and/or, upstream to downstream, conditions?
2. What is the baseline water quality at future restoration/treatment sites?
3. What are the mechanisms of project success?
4. Are installed projects functioning correctly?

List of Projects

1. Westside SURF and Old Mission Creek Restoration

2. Arroyo Burro Restoration, including Mesa Creek daylighting
3. Hope and Haley Diversions
4. Laguna Channel Disinfection (Source Tracking)
5. Golf Course Project (Storm)
6. San Pascual Drain (Source Tracking)
7. Parking Lot LID (Storm)
8. Debris Screens (Creek Walks)
9. Mission Creek Fish Passage (Eutrophication/Dissolved Oxygen)
10. Bird Refuge

D. Beach water quality

Research questions:

1. How to creeks and storm drains relate to beach water quality and warnings?
2. How do other factors (kelp, tides, temperature, and beach use) relate to beach warnings?
3. What are the causes of persistent beach warnings that occur?
4. What is the risk to human health from recreation in creeks and beaches in Santa Barbara?

E. Source Tracking/Illicit Discharge Detection

Research questions:

1. Which subdrainages and/or contribute the greatest loads of pollutants to creeks in Santa Barbara? (CBI)
2. Where, when and how is human waste and/or sewage entering storm drains and creeks?
    a. What happens to the signals of human waste and indicator bacteria levels as water moves downstream away from the source?
    b. How does presence of human waste relate to beach warnings?
3. Do rotting plant material and sediment contribute to high FIB levels in storm drains?
4. What are the impacts of reservoir flushing on metals?
5. Are new hot spots emerging?
6. Specific areas of concern: Barger Canyon, Las Positas Creek, Haley Drain

F. Creeks Walks/Clean ups

Research Questions:

1. Are there new problems in creeks that need to be addressed?
2. Is the amount of trash in creeks decreasing over time?
3. Were decreases in trash observed between 1999 and 2005 due to creek flow histories or the impact of City programs?
4. Will the installation of catch basin screens lead to decreased trash observed in creeks?

G. Bioassessment

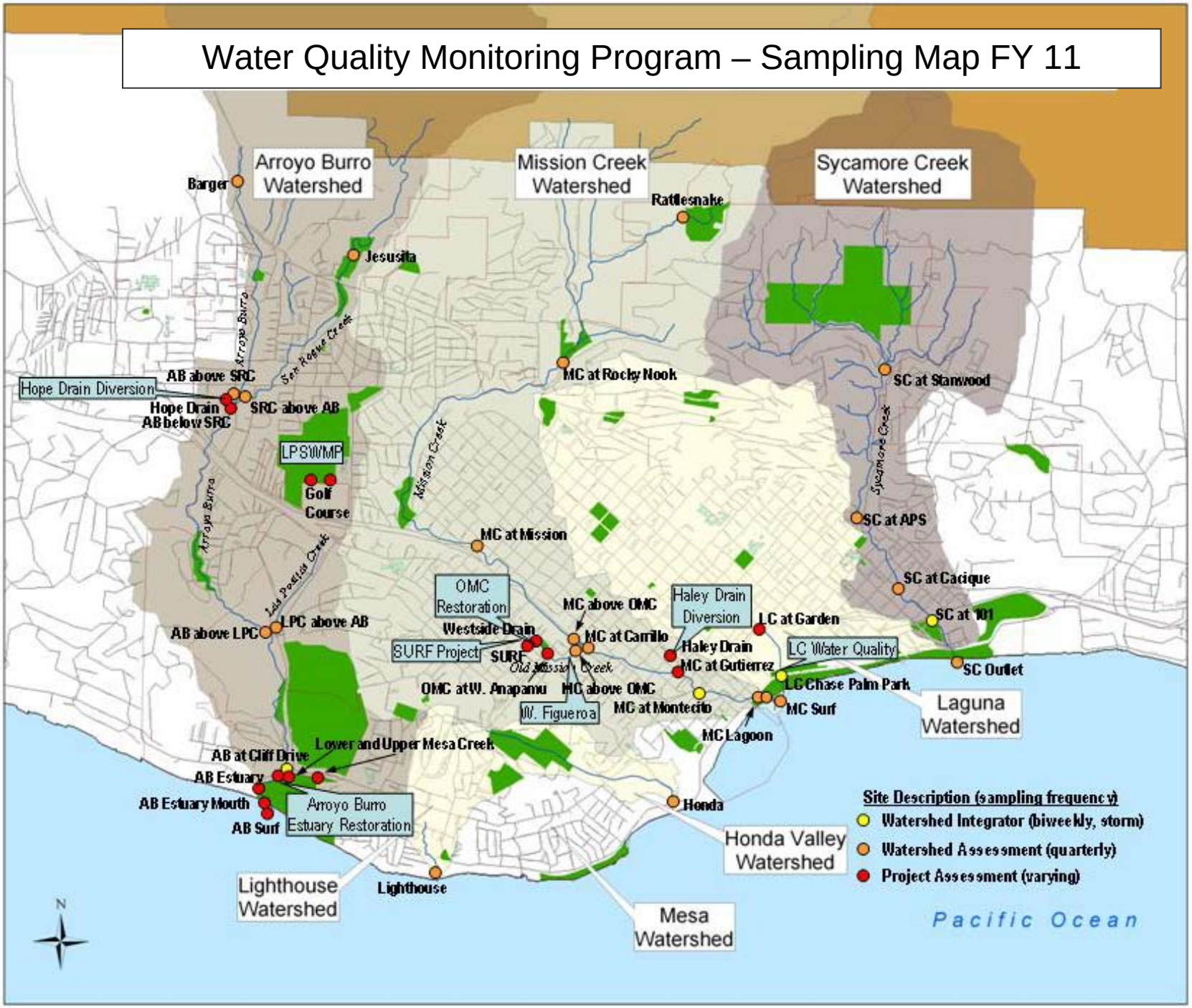
The biological assessment element is used to assess and monitor the biological integrity of local creeks as they respond through time to natural and human influences.

Research Questions:

1. What is the baseline of biological integrity for benthic macroinvertebrates in creeks?
2. Are there differences between upper watershed and lower watershed sites?
3. Are there differences among watersheds?
4. How does the biological integrity in our creeks change over time?
5. How does the biological integrity respond to water quality and restoration projects?

H. Methods Development

1. Can we use the following potential new tools?
    a. Can a chemical fingerprint be used to identify types of sources?
    b. Can the Microtox assay be used?
    c. Can screening kits be used?
    d. K-9 forensics?


Water Quality Monitoring Program – Sampling Map FY 11
Arroyo Burro Watershed
Mission Creek Watershed
Sycamore Creek Watershed
Laguna Watershed
Honda Valley Watershed
Mesa Watershed
Lighthouse Watershed
Barger
Jesusita
Rattlesnake
Hope Drain Diversion
AB above SRC
Hope Drain
AB below SRC
SRC above AB
LPSWMP
Golf Course
MC at Rocky Nook
SC at Stanwood
MC at Mission
SC at APS
SC at Cacique
SC at 101
SC Outlet
OMC Restoration
MC above OMC
Haley Drain Diversion
LC at Garden
Westside Drain
MC at Carrillo
Haley Drain
LC Water Quality
SURF Project
SURF
MC at Gutierrez
LC Chase Palm Park
OMC at W. Anapamu
MC above OMC
W. Figueroa
MC at Montecito
MC Surf
MC Lagoon
AB above LPC
LPC above AB
Lower and Upper Mesa Creek
AB at Cliff Drive
AB Estuary
AB Estuary Mouth
AB Surf
Arroyo Burro Estuary Restoration
Honda
Lighthouse
Site Description (sampling frequency)
Watershed Integrator (biweekly, storm)
Watershed Assessment (quarterly)
Project Assessment (varying)
Pacific Ocean
N

SAMPLING TABLE TO BE UPDATED, PENDING RESULTS OF SUMMER 2010 TESTING

PROGRAM ELEMENT and QUESTIONS	CONSTITUENTS/METHODS	SITES	FREQUENCY	PROJECTED COST
A. Watershed Assessment				
1. Is overall water quality, in terms of indicator bacteria and field properties, getting better over time?	Indicator bacteria, field parameters, flow	Integrator Sites Honda and Lighthouse	Biweekly Quarterly	$3,024
2. How contaminated and/or toxic is sediment at creek sites?	Metals, PAHs, Toxicity, Pyrethroids	Creeks sites TBD	Yearly, in late summer	$8,760
B. Storm Monitoring				
1. What are the highest concentrations of pollutants of concern during storm events, particularly seasonal first flush storms? Do creeks and/or storm drains in Santa Barbara have problems with toxicity during storm events?	Metals, Herbicides, Pesticides, Nutrients, Oil and Grease, Toxicity	Integrator Sites and four storm drains	Yearly, first flush. Collect creek samples early during runoff event. Collect drain samples second.	$9,256
2. What are the loads of pollutants discharged from Santa Barbara creeks during storms?	Metals	Arroyo Burro at Cliff (location of flow gauge and autosampler)	Conduct composite sampling according to Caltrans (2008) during a 1" forecasted storm.	$850
3. What are the sources and routes of pollutants during storms?	Fecal indicator bacteria, Sediment, MBAS (or cationic surfactants), PAHs. Visual observation for foam during storm event.	Arroyo Burro at Cliff Simulated rain and runoff from recently sealed parking lots and/or streets.	Conduct composite sampling according to Caltrans (2008) during a 1" forecasted storm.	$3,745
4. How do restoration/treatment projects impact water quality during storm events?	Bacteria, nutrients, metals, sediment Bacteria, nutrients, metals, sediment, oil and grease, MBAS and toxicity	Seven sites at Golf Course Parking Lot Four	Three storms post project for Golf Course. First flush for Parking Lot 4.	$4,737
C. Restoration and Water Quality Project Assessment				
1. Westside SURF and Old Mission Creek Restoration (see annual report for details)	Indicator bacteria and field parameters	SURF up, SURF down, Westside Drain, OMC at W. Anapamu, 10 sites between Westside Drain and W. Anapamu	Weekly for SURF operation, biweekly for downstream impacts, and quarterly for regrowth study	$4,509

PROGRAM ELEMENT and QUESTIONS	CONSTITUENTS/METHODS	SITES	FREQUENCY	PROJECTED COST
2. Arroyo Burro Restoration, including Mesa Creek daylighting (Suspension of quarterly testing until results from biweekly testing warrant a change).	Indicator bacteria and field parameters	AB at Cliff, Mesa upper, Mesa lower, AB Estuary upper, AB Estuary Mouth, AB Surf	Biweekly	$4212
3. Hope and Haley Diversions	Indicator bacteria and field parameters	Hope Diversions, Haley Pump	Biannual	$108
4. Laguna Channel Disinfection (Source Tracking)	Indicator bacteria and field parameters	Laguna at Chase Palm (already covered by routine)	Biweekly	Included above.
5. Golf Course Project (Storm)	See storm monitoring			Included above.
6. Parking Lot LID (Storm)	See storm monitoring			Included above.
7. Debris Screens (Creek Walks)	See creek walks			No lab cost.
8. Mission Creek Fish Passage (Eutrophication/Dissolved Oxygen)	Dissolved Oxygen, pH, temperature, conductivity	MC Lagoon, MC upper reaches	Install probes for summer months, collect data continuously	No lab cost.
9. Bird Refuge	Indicator bacteria, chlorophyll a, nutrients, and field parameters	Bird Refuge Inflow, Landing and Outlet	Monthly	$1,884
D. Beach water quality				
1. How to creeks and storm drains relate to beach water quality and warnings, along with other factors such as kelp, tides, temperature (air, creek, ocean), beach use?	Multivariate statistical model on retrospective data. Also see source tracking.			No lab cost.
2. Is growth on sediment and/or kelp responsible for beach warnings?	Sample plan to be determined.			$2,700
3. What are the causes of persistent beach warnings that occur?	Conduct additional surveillance and sampling (indicator bacteria and/or DNA techniques) up creek and within estuaries when persistent warnings occur			$1,350
4. What is the risk to human health from recreation in creeks and beaches in Santa Barbara?	Use forthcoming epidemiology studies in Southern California to conduct simple model of illness rates at Santa Barbara beaches.			No lab cost.
E. Source Tracking/Illicit Discharge Detection				
1. Which subdrainages and/or contribute the greatest loads of pollutants to creeks in Santa Barbara? (CBI)	Source Tracking Grant			Grant funded..
2. Where, when and how is human	Source Tracking Grant			Grant funded.

PROGRAM ELEMENT and QUESTIONS	CONSTITUENTS/METHODS	SITES	FREQUENCY	PROJECTED COST
waste and/or sewage entering storm drains and creeks?				
3. What happens to the signals of human waste and indicator bacteria levels as water moves downstream away from the source?	Source Tracking Grant			Grant funded.
4. How does presence of human waste relate to beach warnings?	Source Tracking Grant			Grant funded.
5. Do rotting plant material and sediment contribute to high FIB levels in storm drains?	Work with Streets Division to conduct pilot study on catch basin and storm drain cleaning on indicator bacteria levels.	Possible site: Montecito St. in Laguna Channel Watershed. Ideal sites are located at terminal upstream end of storm drain, with easy access for cleaning and sampling.	Monthly.	$2,700
6. What are the impacts of reservoir flushing on metals?	Metals, sediment.	Rattlesnake Creek and Reservoir outlet.	Single event.	$575
7. Are new hot spots emerging?	Observation, enforcement.	Serena Drain and others		
8. Specific areas of concern: Barger Canyon Las Positas Creek Lower Mission Mid Arroyo Burro	Chemical fingerprint (Fluoride, potassium, ammonium, boron, MBAS) , indicator bacteria	Barger Canyon (5 sites upstream) Las Positas Creek (Modoc to Arroyo Burro, 5 sites) Lower Mission (5 sites between OMC and Montecito Street) Mid Arroyo Burro (5 sites SRC and LPC)	Quarterly	$12,000
F. Creeks Walks/Clean ups				
1. Are there new problems in creeks that need to be addressed?	Creek clean ups			No lab cost.
2. Is the amount of trash in creeks decreasing over time?	Weight of trash removed each year.			No lab cost.
3. Were decreases in trash observed between 1999 and 2005 due to creek flow histories or the impact of City programs?	Continue measuring and marking GPS coordinates of trash in Old Mission Creek and Lower Mission Creek (Oak Park to beach).			No lab cost.
4. Will the installation of catch basin screens lead to decreased trash observed in creeks?	See 3.			No lab cost.

PROGRAM ELEMENT and QUESTIONS	CONSTITUENTS/METHODS	SITES	FREQUENCY	PROJECTED COST
G. Bioassessment	See Bioassessment Proposal and Reports.			No lab cost.
H. Methods Development				
1. Can a chemical fingerprint be used to identify types of sources?	Chemical fingerprint (Fluoride, potassium, ammonium, boron, MBAS)	Fingerprint sources: groundwater, city water, reclaimed water, irrigation runoff, wastewater influent.		$3,000
2. Can the Microtox assay be used?	Investigate costs and options.			No lab cost.
3. Investigate field screening kits.	Investigate costs and options.			
4. K-9 forensics?	Investigate costs and options.			No lab cost.
TOTAL LAB COST				$64,910